Claims

What is claimed is:

1. A method of guiding a vehicle, the method comprising:

establishing elevation data and corresponding location data for a work area;

determining location data, including a particular location of a vehicle, within the work area;

estimating at least one of roll data and pitch data corresponding to the particular location,

guiding the vehicle based upon at least one of the estimated roll data and the pitch data such that the vehicle follows a target path.

2. The method according to claim 1 wherein the roll data comprises a roll angle and wherein the pitch data comprises a pitch angle.

3. The method according to claim 1 wherein the work area is divided into a group of cells, and wherein each cell is associated with a corresponding elevation data and respective location data.

4. The method according to claim 1 further comprising establishing respective slope data and aspect data associated with the location data, the slope data indicating a change in elevation of terrain in the work area and the aspect data indicating the direction of slope.

5. The method according to claim 1 wherein the target path comprises a substantially linear or arc path segment.

6. The method according to claim 1 wherein the guidance comprises generating a steering compensation data to compensate for changes in the roll data and pitch data between an uncorrected vehicular path and the target path.

7. The method according to claim 1 wherein the estimating comprises estimating the pitch data based on one or more of the following: location data, elevation data, a current position of the vehicle, an expected position of the vehicle, vehicle speed, vehicle heading, vehicular velocity, and a path plan.

8. The method according to claim 1 wherein the estimating comprises estimating the pitch data consistent with the following equation:

$\theta(Pitch\ angle) = \Theta_x = \arcsin(\sin\Theta\sin\Psi)$, where Ψ is the aspect, Θ is the slope, and Θ_x is the longitudinal slope angle.

9. The method according to claim 1 wherein the estimating comprises estimating the roll data based on one of more of the following: location data, elevation data, a current position of the vehicle, an expected position of the vehicle, vehicle speed, vehicle heading, vehicular velocity, and a path plan.

10. The method according to claim 1 wherein the estimating comprises estimating the roll data consistent with the following equation:

$\Phi(Roll\ angle) = \Theta_y = \arcsin(\sin\Theta\cos\Psi)$, where Ψ is the aspect, Θ is the slope, and Θ_y is the lateral slope.

11. A system of guiding a vehicle, the system comprising:

a data storage device for storing elevation data and corresponding location data for a work area;

a location-determining receiver for determining a particular location of a vehicle within the work area;

a data processor comprising a roll estimator for estimating a roll data and a pitch estimator for estimating pitch data corresponding to the particular location; and

a steering controller for guiding the vehicle utilizing the estimated roll data and the pitch data such that the vehicle follows a desired path.

12. The system according to claim 11 wherein the roll data comprises a roll angle and wherein the pitch data comprises a pitch angle.

13. The system according to claim 11 wherein the work area is divided into a group of cells, and wherein each cell is associated with a corresponding elevation and a respective location.

14. The system according to claim 11 wherein the data storage device further stores respective slope data and aspect data associated with the location data, the slope data indicating a change in the elevation and the aspect data indicating the direction of the slope.

15. The system according to claim 11 wherein the desired path comprises a substantially linear and arc path segment.

16. The system according to claim 11 wherein the data processor generates a steering compensation signal to compensate for changes in the roll data and pitch data between a first location and a second location within the work area to conform to the desired path.

17. The system according to claim 11 wherein the pitch estimator estimates the pitch data based on one or more of the following: location data, elevation data, a current position of the vehicle, an expected position of the vehicle, vehicle speed, vehicle heading, vehicular velocity, and a path plan.

18. The system according to claim 11 wherein the pitch estimator estimates the pitch data consistent with the following equation:

$\theta(Pitch\ angle) = \Theta_x = \arcsin(\sin\Theta\sin\Psi)$, where Ψ is the aspect, Θ is the slope, and Θ_x is the longitudinal slope.

19. The system according to claim 11 wherein the roll estimator estimates the roll

data based on one of more of the following: location data, elevation data, a current position of the vehicle, an expected position of the vehicle, vehicle speed, vehicle heading, vehicular velocity, and a path plan.

20. The system according to claim 11 wherein the roll estimator estimates the roll
data consistent with the following equation:

$\Phi(Roll\ angle) = \Theta_y = \arcsin(\sin\Theta\cos\Psi)$, where Ψ is the aspect, Θ is the slope, and Θ_y is the lateral slope.